

10-4 Common Logs

$$\log_{10} x \longleftrightarrow \log x$$

Base of 10

The common logs are used in:

- the richter scale
- pH levels
- decibels of sound

Solve

$$\log_{10} x = 1.65$$

$$10^{1.65} = x$$

$$44.7 = x$$

$$\log y = 1.34$$

$$10^{1.34} = y$$

$$21.9 = y$$

$$\log z = 1.08$$

$$12.0 = z$$

Calculator

$$\log 45 \approx 1.65$$

$$\log 22 \approx 1.34$$

$$\log 12 \approx 1.08$$

Solving Exponential Equations

ex

$$3^x = 27$$

$$3^x = 3^3$$

$$x = 3$$

Solving Exponential Equations

ex

$$3^{2x} = 5$$

$$\log 3^{2x} = \log 5$$

$$2x \cdot \log 3 = \log 5$$

$$2 \log 3$$

$$x = \frac{\log(5)}{(2 \log 3)}$$

$$x = .7325$$

~~$$3^{2x} = 5$$~~

ex

$$2^x = 7$$

$$\log 2^x = \log 7$$

$$x \log 2 = \log 7$$

$$x = \frac{\log 7}{\log 2}$$

$$x = 2.8074$$

ex:

$$\frac{1}{2}^x \geq 6$$

Be careful of dividing by
a negative! (switch
symbol)

ex:

$$42^{x-1} = 17^{3x-1}$$

$$\begin{aligned} (x-1) \log 42 &= (3x-1) \log 17 \\ x \log 42 - \log 42 &= x \cdot 3 \log 17 - \log 17 \\ x \log 42 - x \cdot 3 \log 17 &= \log 42 - \log 17 \\ x(\log 42 - 3 \log 17) &= \log 42 - \log 17 \\ x &= \frac{(\log 42 - \log 17)}{(\log 42 - 3 \log 17)} = -1.899 \end{aligned}$$

ex

Evaluate

$$\begin{aligned} \log_2 9 &= y \\ 2^y &= 9 \\ y \log 2 &= \log 9 \\ y &= \frac{\log 9}{\log 2} = 3.1699 \end{aligned}$$

Cannot do on calc because base of 2

Change of Base Formula

$$\log_a n = \frac{\log_b n}{\log_b a} \quad \begin{array}{l} n > 0 \\ a > 0 \\ b > 0 \\ b \neq 1 \\ a \neq 1 \end{array}$$

ex

$$\log_4 7 = \frac{\log 7}{\log 4} = 1.4036$$

ex

$$\log_3 5 = \frac{\log 5}{\log 3} = 1.4650$$

Show

$$\log_{25} 2 = \frac{\log_5 2}{2}$$

$$\frac{\log_5 2}{\log_5 25}$$

$$\frac{\log_5 2}{2} = \frac{\log_5 2}{2} \checkmark$$

p550
28-50 even